AAPA's 14th International Flexible Pavements Conference

Sydney
25–28 September 2011

Topic: Emergency Remedial Intervention on the Secondary Runway at the East London Airport – Not High Tech, But High Risk

PRESENTER: Simon Tetley
Position: Senior Associate
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AAPA
AUSTRALIAN ASPHALT PAVEMENT ASSOCIATION

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GIBB
ENGINEERING & SCIENCE

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EAST LONDON AIRPORT
AIRPORTS COMPANY SOUTH AFRICA

Presentation Topics

The areas covered by the presentation are:

- Project Background
- Project Brief
- Time Frames
- Design Rationale
- Risk
- Construction Stage
- Summary

Project Background

- Main and secondary runways were re-surfaced with open graded asphalt at some stage
- Centre portion of main runway was “inlaid” with modified asphalt in circa 2005. Secondary centre portion “rejuvenated” with a modified bituminous surface sealant under the same contract
- The outer portions of the runways (area between the 20m centre strip and the edge of the surfacing) received no treatment
- Aggregate loss / ravelling of the outer portions of the runways was a concern – particularly severe on secondary runway (06/24)
- Ravelling is not a major issue on a road, but on runways this distress has serious safety (skid resistance) and F.O.D. implications
- Pro-active intervention identified by Airports Company South Africa (ACSA)
- Consultant “brief” – Investigate the mechanisms of distress and deliver a cost effective design solution, with consideration to planned future full rehabilitation of the runways

Aerial View of the East London Airport

Layout of the East London Airport

The Project Brief

- Assessment of the condition of the runways and taxiways
- Identification of the optimal remedial measures with regard to available budget, performance and incorporation into future planned runway rehabilitation
- Design, documentation and procurement
- Construction management and supervision of the Works on a “full time” basis

Project Timeframes

Design / Procurement:

Ø Assessment and Design Report	17 November 2009
Ø Procurement Documentation	04 December 2009
Ø Invite tenders	08 December 2009
Ø Tenders closure	15 December 2009
Ø Submit tender evaluation report	16 December 2009
Ø ACSA tender board	18 December 2009
Ø Appoint contractor	21 December 2009

Construction:

Ø Contract commencement date	06 January 2010
Ø Commence actual construction	08 February 2010
Ø Contractual completion date	17 March 2010
Ø Actual completion date	20 March 2010

Design Rationale

- Aggregate loss / ravelling, particularly when occurring on a porous surfacing, is typically addressed on roadways (in South Africa) by spraying the affected areas with some form of bituminous sealing agent or slurry seal
- Asphalt on runway 06/24 so severely oxidized that mere rejuvenation would present future risks – F.O.D. and skid resistance
- Asphalt “mill and fill” considered only practicable solution
- Could be incorporated into future rehab design of runways
- Cores drilled

- Typical upper pavement layers clearly illustrates friable porous asphalt surfacing +/-40mm, previous asphalt wearing course and large aggregate bitumen bound macadam

Design Rationale - Continued

- Whilst only one viable methodology, potentially several asphalt mixes could be used :
  - UTFC (Ultra Thin Friction Course)
  - Bitumen Rubber Asphalt Semi Open Grade (BRASO)
  - Continuously Graded Medium Textured Asphalt

- "Pros" and "Cons"
  - UTFC
    - ü Good Friction Capability
    - o Not structural (and only 20mm thick) – an additional asphalt base would be needed to create requisite thickness and strength
    - o Availability of aggregate and special paver (self tacking) in East London at the time
    - o Cost
    - o Will be "overlaid" during planned rehabilitation
  - BRASO
    - ü Good Friction Capability
    - o Availability of BR blending facility at the East London asphalt plant (only 1 Plant)
    - o Will be "overlaid" during planned rehabilitation
    - o Cost
  - Continuously Graded Medium Textured Asphalt
    - ü Adequate Friction Capability
    - ü Comparable cost
    - ü Readily available
    - ü Can be incorporated into future rehab design strategy

Design Rationale – Mix Design

- Mix design compliance to SA Standard Specifications (COLTO).
- Marshall mix design undertaken on asphalt supplied by the sole manufacturer in the area. Summary of main design parameters:

PROPERTY	LIMITS	TARGET
Grading		
13.200	100	100
9.500	82-100	91
4.750	54-75	64
2.360	35-50	43
1.180	27-42	34
0.600	18-32	25
0.300	11-23	17
0.150	7-16	12
0.075	4-10	7
Target Binder Content	4.9	
Marshall Design Voids (VIM)	5.3	

- Field compaction specification to 93% of MTD (Rices ‘)

Risk Considerations

- Risk Register

STAGE	RISK	EXPOSURE	MITIGATION MEASURE	
DESIGN	REQUIRED REHABILITATION WORK EXCEEDING CAPEX APPROVED CONSTRUCTION BUDGET	FINANCIAL	OPTIMAL PAVEMENT DESIGN IDENTIFICATION. SHOULD AN "OVERSPEND" BE UNAVOIDABLE, THIS MUST BE COMMUNICATED TO ACSA AT THE EARLIEST OPPORTUNITY	
	NEW RUNWAYS AND TAXIWAYS NOT ACHIEVING THEIR STRUCTURAL DESIGN LIFE	FINANCIAL	DESIGN UNDER THE LEADERSHIP OF RECOGNISED AIRPORT PAVEMENT DESIGN SPECIALIST AND USING BEST PRACTICE DESIGN METHODOLOGY	
	DESIGN CONSTRUCTION METHODOLOGY IN APPROPRIATE FOR THE REQUIRED CONSTRUCTION PROCESSES - POSSIBLE "LATE" OPENING AFTER NIGHT SHIFT	FINANCIAL / END USER SAFETY	METHODOLOGY TO BE IDENTIFIED THAT WILL NEGATE THE POSSIBILITY OF LATE OPENING. METHODOLOGY TO BE WORKSHOPPED WITH THE RELEVANT PARTIES	
	SITE STAFF RESOURCING	FINANCIAL / END USER SAFETY	ENSURE THAT THE BEST PERSONNEL ARE SELECTED. PROPOSED SITE PERSONNEL ARE TO BE APPROVED BY THE RELEVANT PERSONS AT ACSA. EARLY IDENTIFICATION OF CANDIDATES	
CONSTRUCTION	AIRCRAFT SAFETY PROCEDURES AND NOTAMS	OPERATIONAL SAFETY	COMPREHENSIVE LONG TERM NOTAM'S TO COVER ALL POSSIBLE ISSUES SUCH AS INITIAL FRICTION LOSS ETC. TO BE WORKSHOPPED WITH ACSA, ATNS AND OTHER AIP's	
	SECURITY BREACHES	OPERATIONAL SAFETY	DEDICATED FULL TIME ACSA SECURITY PERSON TO BE APPOINTED WITH THE NECESSARY SUPPORT	
	OPERATIONAL SAFETY ISSUES	OPERATIONAL SAFETY	CLOSE LIAISON WITH RELEVANT AIRPORT AUTHORITIES (ACSA,ATNS ETC) ISSUE OF NOTAM'S AND AIP NOTICES	
	SAFETY OF CONTRACTOR'S / ENGINEER'S SITE PERSONNEL	SAFETY	INDUCTION TRAINING FOR ALL SITE PERSONNEL AND AVOP LICENCING. CONTRACTOR TO APPOINT FULL TIME SAFETY OFFICER. AUDITS UNDERTAKEN BY EXTERNAL OHS PRACTITIONER ON A 3 MONTHLY BASIS	
	SAFETY OF AIRCRAFT AND PASSENGERS	FINANCIAL / OPERATIONAL SAFETY	CONTRACTOR TO COMPLY WITH THE "MANUAL OF PROCEDURES FOR WORKING AIRSIDE". SITE MONITORING PERSONNEL TO STRICTLY MONITOR AND ENFORCE COMPLIANCE	
	FOREIGN OBJECT DAMAGE.(F.O.D.).	FINANCIAL / OPERATIONAL SAFETY	COMPLIANCE WITH THE AIRSIDE PROCEDURE MANUAL AND INSPECTIONS BY THE ENGINEER'S REPRESENTATIVE PRIOR TO THE OPENING OF ANY WORK AREAS	
	MAJOR PLANT BREAKDOWNS	FINANCIAL / TIME / OPERATIONAL SAFETY	CONTRACTOR WILL BE CONTRACTUALLY OBLIGED TO HAVE REPLACEMENT PLANT AVAILABLE ON SITE IE A STAND BY PAVER, MILLING MACHINE, ROLLERS ETC. IN ADDITTION TO REPLACEMENT PLANT, CONTRACTOR MUST HAVE A CONTINGECY "PLAN" FOR THE IMMEDIATE REMOVAL FROM AIRSIDE OF ANY BROKEN DOWN PLANT ITEMS	
	MATERIALS SUPPLY (BITUMEN)	FINANCIAL / TIME	ANY PLANNED DISRUPTIONS (MAINTENANCE) TO BE IDENTIFIED PRIOR TO CONSTRUCTION COMMENCEMENT	
	MATERIALS SUPPLY (ASPHALT)	FINANCIAL / TIME / OPERATIONAL SAFETY	DAILY ASPHALT REQUIREMENTS TO BE "LINNKED" TO THE ABILITY OF LOCAL ASPHALT PLANT AND/OR SITE BASED ASPHALT PLANT TO SUPPLY. SUFFICIENT ASPHALT (TO CLOSE EXCAVATIONS) TO BE "ON SITE" OR IN STORAGE BINS PRIOR TO ANY EXCAVATIONS BEING OPENED	
	CONSTRUCTION QUALITY	FINANCIAL / END USER SAFETY	IT IS ENVISAGED THAT A SITE LABORATORY WILL BE RECTED. THIS WILL ENABLE TIMEOUS TURN AROUND TIMES FOR TESTING. THE STATISTIACAL JUDGEMENT PLANS AS PER COLTO WILL BE USED FOR ACCEPTANCE CONTROL AND STRINGENT "HANDS ON" SITE MONITORING WILL BE IMPLEMENTED BY RE STAFF WHO HAVE EXPERIENCE OF UNDERTAKING SIMILAR AIRSIDE PROJECTS	
	CONSTRUCTION CONTRACT PERIOD OVERRUN	FINANCIAL / TIME	EXTENSIONS OF TIME DUE TO INCLEMENT WEATHER CANNOT REALLY BE MITIGATED - WITH THE EXCEPTION OF "ALLOWABLE" DELAYS AS INDICATED IN THE CONTRACT DOCUMENT. EXTENSIONS OF TIME CAUSED BY DESIGN CHANGES OR OTHER REASONS CAN BE MITIGATED BY ENSURING THAT THE DESIGNS AS DOCUMENTED ARE CORRECT AND APPLICABLE AND THAT THE CONTRACT DOCUMENTATION IS AS "WATER TIGHT" AS POSSIBLE	

POTENTIALLY DISASTEROUS

SERIOUS

MODERATE

Construction Stage

Constraints

- Available working time – 21:30 to 05:00
- Night time work
- Secondary Plant on site
- Cleansing of work area
- Accommodation of Construction Traffic
- Induction Requirements
- Penalty Clauses

Construction Stage

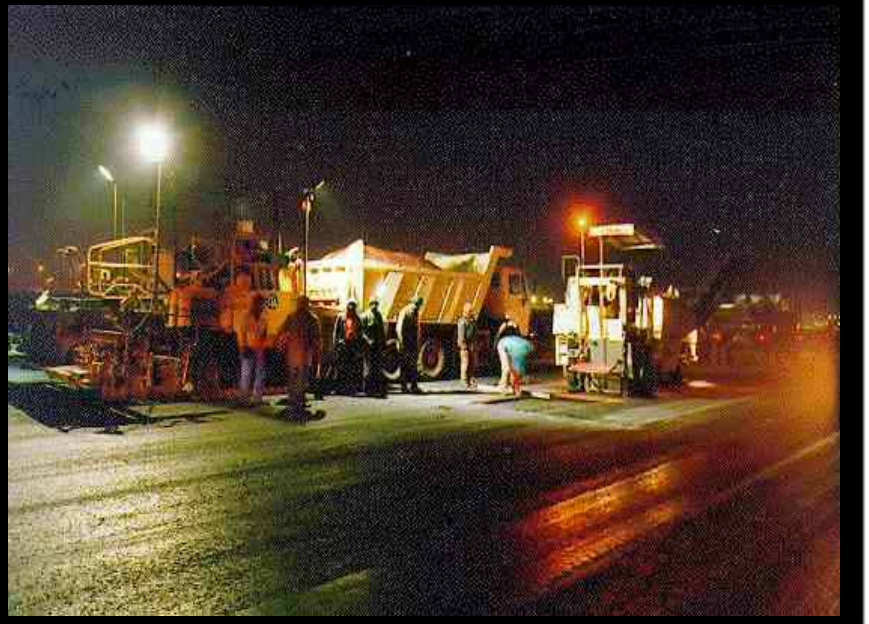
Scope of Works

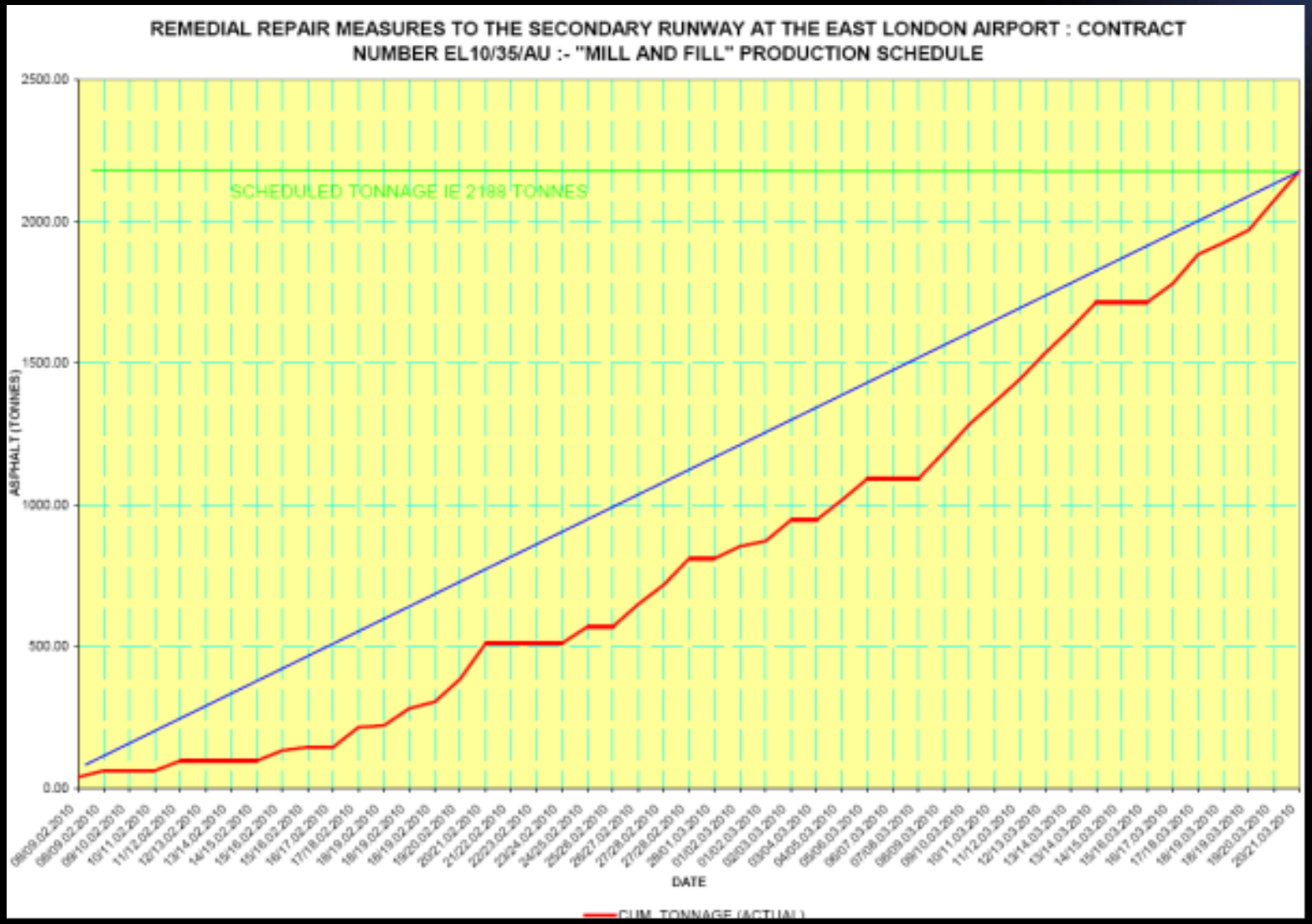
- Milling of distressed asphalt
- Placement of RAP on perimeter security road
- Paving of asphalt inlays
- Painting of runway markings
- 10 weeks contract period

Construction Stage

Methodology

- "Start Up"
- Milling
- Cleaning and tack
- Paving
- Perimeter road RAP
- Site clearance operations – start no later than 03:00
- Quantities
  - 2500 tonnes asphalt
  - 17,700 square metres ave depth +/-60mm
  - 1050 cubic metres of RAP
  - Average paving per shift - 90 tonnes



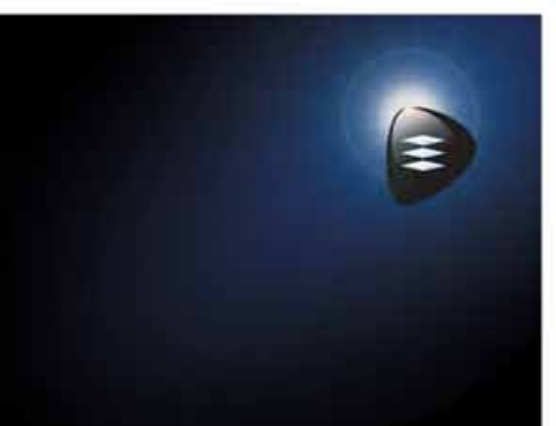

REMEDIAL REPAIR MEASURES TO THE SECONDARY RUNWAY AT THE EAST LONDON AIRPORT : CONTRACT NUMBER EL10/35/AU :- "MILL AND FILL" PRODUCTION SCHEDULE
SCHEDULED TONNAGE IE 2188 TONNES
ASPHALT (TONNES)
2500.00
2000.00
1500.00
1000.00
500.00
0.00
DATE
CUM. TONNAGE (ACTUAL)

Construction Stage

Quality / Acceptance Control

- Position of each load recorded
- Temperature
- Visual inspection and tolerance checks
- Laboratory testing
  - 15 “Hot Box” samples to check asphalt against design specs
  - 57 cores for field density checks
  - No failures

Construction Stage



Incidents

- Disaster on night 2
- Mitigating measures
  - All calculations triple checked
  - Barricades
  - No milling before all asphalt was on site PLUS 5%

Summary

- Challenges in terms of risk as opposed to technical
- Operational risk
  - Late opening
  - F.O.D.
- Weather – all excavations must be reinstated, rain damaged asphalt removed
- Constant programme adjustments resulted in contract being completed on time despite losing 50% of contract period
- Contract completed with 3% of budget to spare
- Undertaking runway works at operational airport high risk. Measured in minutes and kilogrammes as opposed to weeks, months and tonnes
- Structural rehabilitation of runways and taxiways project is at tender stage, Commencement in January 2012. Anticipated contract duration = 15 months


Thank You